



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,740	12/11/2003	Vinod Philip	2003P15291US	8395

7590 04/18/2005

Siemens Corporation  
Intellectual Property Department  
170 Wood Avenue South  
Iselin, NJ 08830

EXAMINER

BAREFORD, KATHERINE A

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/733,740

Applicant(s)

PHILIP ET AL.

Examiner

Katherine A. Bareford

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 5 and 13-21 is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

The amendment of March 12, 2005 has been received and entered.

#### *Claims*

1. The Examiner understands the term "low velocity oxygen fuel process" to mean a combustion powder thermal spray process or powder flame spray process, as described in the cited "Combustion Powder Thermal Spray Process (Flame Spray Process)" document.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. The rejection of claims 1 and 6-7 under 35 U.S.C. 103(a) as being unpatentable over Harrington et al (US 4645716) is withdrawn due to applicant's March 12, 2005 amendments to require that the zirconia be stabilized.

5. Claims 1 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Longo et al (US 3607343).

Longo teaches a method of applying a zirconia (zirconium oxide) based thermal barrier coating. Column 3, line 60 through column 4, line 15. The method includes selecting a composite powder comprising a first constituent that can comprise stabilized zirconia particles. Column 2, lines 40-52 (see lines 49 and 51 – stabilized or unstabilized zirconia can be used). The powder also has a second constituent that can comprise a second ceramic material, such as titanium oxide or manganese oxide. Column 2, lines 5-15, 40-50 and 65-75. The second ceramic material has a melting temperature sufficiently low so that the second constituent particles can at least partially melt when applied. Column 1, lines 10-15, column 2, lines 40-50 and column 3, lines 50-55 (given the melting temperatures of manganese oxide (1705 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia). The particles can be applied by

a.

conventional powder-type flame spray equipment (a low velocity oxygen fuel

VB

process/LVOF). Column 3, lines 50-55. The spray powder can also be a mixture of particles used in thermal spraying. Column 1, lines 70-75.

Claims 6-7: the titanium oxide or manganese oxide can be 1-50, preferably 5-25 percent of the volume of the total powder materials, and thus, can be 25 volume % of the particles. Column 2, lines 20-25.

Longo teaches all the features of these claims except that the LVOF process melts the titanium/manganese oxide particles.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo to at least partially melt the titanium/manganese oxide particles when spraying with powder flame spraying in order to provide a desirably dense and bonded coating, because Longo teaches that conventional flame spray processes at least heat softens the coating material when spraying, and given the melting temperatures of manganese oxide (1705 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia.

6. Claims 2-3 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Longo as applied to claims 1 and 6-7 above, and further in view of Japan 2002-275615 (hereinafter '615).

Longo teaches all the features of these claims except (1) the calcium or strontium titanate (claims 2-3) and (2) the coefficient of thermal expansions (claims 8-10).

However, '615 teaches that a desirable material to be applied by thermal spraying to a substrate to form a thermal barrier coating is calcium titanate ( $\text{CaTiO}_3$ ), which can be applied with yttria stabilized zirconia. See the abstract.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo to use calcium titanate particles with the stabilized zirconia – titanium/manganese oxide (flux) particles as suggested by '615, in order to provide a desirable barrier layer, because Longo teaches to provide a thermal barrier layer using stabilized zirconia and flux particles that can be titanium oxide and that multiple materials can be present, and '615 teaches the desirability of using stabilized zirconia and to add a form of titanium oxide, calcium titanate, to form thermal barrier coatings. Given the temperature of spraying, the titanate would also partially melt. Furthermore, it would further have been obvious to modify Longo in view of '615 to use strontium titanate with an expectation of providing a desirable thermal barrier coating, because Longo and '615 indicate the desirability of using stabilized zirconia and titanium oxide materials when forming thermal barrier coatings, and it is the Examiner's position that strontium titanate is a well known titanium oxide material. Note that Longo also teaches to use titanate materials as the flux (column 2, line 43). As a result of using the stabilized zirconia and specific titanium oxide materials, the claimed ranges of the coefficients of thermal expansion would be inherently provided as in claims 8-10.

7. Claims 4 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Longo as applied to claims 1 and 6-7 above, and further in view of Spitsberg et al (US 2003/0027012).

Longo teaches all the features of these claims except (1) the sodium-zirconium-phosphate-silicate (claim 4) and (2) the thermal conductivity (claims 11-12).

However, Spitsberg teaches that a desirable material to be applied by thermal spraying to a substrate to form a thermal barrier coating is zirconium phosphate materials (NZP-family materials), including sodium zirconate phosphate, which are applied with yttria stabilized zirconia (YSZ). Paragraphs [0022] and [0025].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo to use NZP material particles with the stabilized zirconia – titanium/manganese oxide (flux) particles as suggested by Spitsberg, in order to provide a desirable barrier layer, because Longo teaches to provide a thermal barrier layer using stabilized zirconia and flux particles and that multiple materials can be present, and '615 teaches the desirability of using stabilized zirconia and a form of NZP materials to form thermal barrier coatings. Given the temperature of spraying, the NZP materials would also at least partially melt. It would further have been obvious to modify Longo in view of Spitsberg to use sodium-zirconium-phosphate-silicate with an expectation of providing a desirable thermal barrier coating, because <sup>LONGO</sup>~~Harrington~~ and Spitsberg indicate the desirability of using stabilized zirconia and NZP materials, including those with sodium zirconate phosphate when forming thermal barrier

coatings, and it is the Examiner's position that sodium-zirconium-phosphate-silicatis a well known NZP material. As a result of using the stabilized zirconia and NZP materials, the claimed ranges of the coefficients of thermal conductivity would be inherently provided as in claims 11-12.

*Allowable Subject Matter*

8. Claims 5 and 13-21 are allowed over the prior art of record.

While it is suggested to apply zirconia/other ceramic thermal barrier materials by flame spraying as discussed above, and it is known to provide access to a damaged region of a zirconia based thermal barrier coating for repair, to clean the region, and apply a new thermal barrier coating (as discussed in Nagaraj et al, column 4, lines 45-65 and column 6, lines 10-15), it is not taught or suggested by the prior art of record to apply a coating of the claimed materials to a component without removing the component from a machine of which it forms a part as is required by claim 5 and independent claim 13.

*Response to Arguments*

9. Applicant's arguments with respect to claims 1-4 and 6-12 have been considered but are moot in view of the new ground(s) of rejection.

As to the use of a stabilized zirconia material as is now required, the Examiner has cited Longo et al (US 3607343) as discussed in the rejection above.



*Conclusion*

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and for After Final communications.

Art Unit: 1762

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
KATHERINE BAREFORD  
PRIMARY EXAMINER